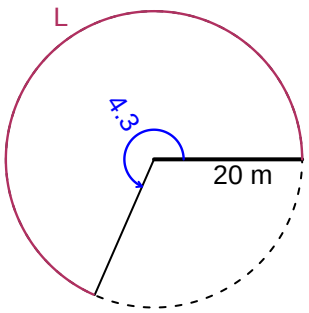
Name: Date:

Trig Final (Solution v31)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 20 meters. The angle measure is 4.3 radians. How long is the arc in meters?

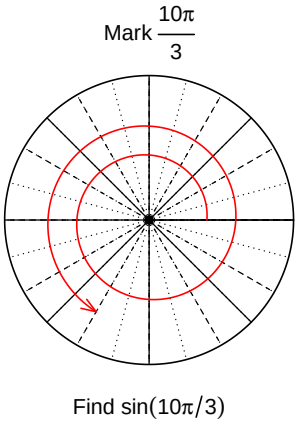


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

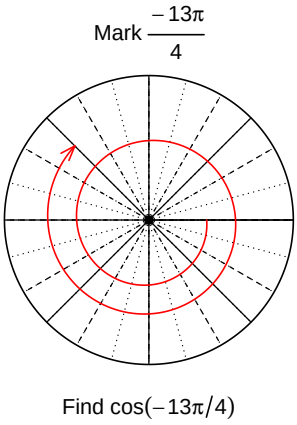
$L = 86$ meters.

Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{10\pi}{3}\right)$ and $\cos\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(10\pi/3)$



Find $\cos(-13\pi/4)$

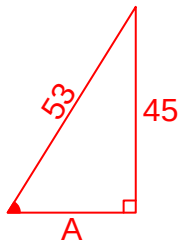
$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{45}{53}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

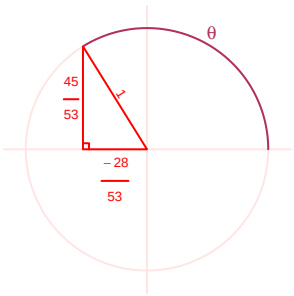
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 45^2 = 53^2$$
$$A = \sqrt{53^2 - 45^2}$$
$$A = 28$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-28}{53}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.24$ meters, an amplitude of 6.2 meters, and a frequency of 8.7 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.2\cos(2\pi 8.7t) - 2.24$$

or

$$y = -6.2\cos(17.4\pi t) - 2.24$$

or

$$y = -6.2\cos(54.66t) - 2.24$$